CLAIMS

What is claimed is:

1. An apparatus for inspection of substrates, the apparatus comprising:
a dual-energy electron beam (e-beam) source configured to generate both a higher-energy e-beam component and a lower-energy e-beam component;
an energy-dependent dispersive device configured to introduce dispersion between said two e-beam components, wherein said two e-beam components exit the dispersive device at different angles of trajectory;
a beam separator configured to receive said two dispersed e-beam components and substantially cancel said dispersion so that said two e-beam components are rejoined in trajectory; and
an objective lens configured to focus said two rejoined e-beam components onto an area of the substrate.

2. The apparatus of claim 1,
wherein impingement of one component of the two e-beam components onto the area generates a scattered e-beam that is utilized for imaging, and
wherein impingement of both the components of said e-beam onto the area provides compensation for surface charging.

3. The apparatus of claim 2,
wherein said one component comprises the higher-energy e-beam component, and
wherein secondary or backscattered electrons are utilized for imaging.

4. The apparatus of claim 3, wherein the scattered e-beam comprises back-scattered electrons.

5. The apparatus of claim 3, wherein the scattered e-beam comprises secondary electrons.

6. The apparatus of claim 2,

wherein said one component comprises the lower-energy e-beam component, and

wherein the scattered e-beam comprises reflected electrons.

7. The apparatus of claim 1, wherein the dual-energy e-beam source comprises two concentric cathodes.

8. The apparatus of claim 4, wherein the two concentric cathodes comprise an inner cathode biased at a high negative voltage with respect to the substrate, and an outer cathode biased by an additional negative voltage with respect to the inner cathode.

9. The apparatus of claim 1, wherein the energy-dependent dispersive device is operated in a unity magnification mode.

10. The apparatus of claim 1, wherein the energy-dependent dispersive device comprises an omega type energy filter that disperses said two e-beam components using magnetic fields.

11. The apparatus of claim 1, wherein the energy-dependent dispersive device comprises an alpha type energy filter that disperses said two e-beam components using magnetic fields.

12. The apparatus of claim 2, wherein the beam separator is further configured to separate the scattered e-beam from said two e-beam components.

13. The apparatus of claim 2, further comprising:

projection optics configured to image the scattered e-beam.

14. The apparatus of claim 1, further comprising:
a transfer lens configured to transfer said two dispersed e-beam components from the energy-dependent dispersive device to the beam separator.

15. A method for in-line inspection of a substrate, the method comprising:
generating dual-energy e-beam including a higher-energy e-beam component and a lower-energy e-beam component;
introducing dispersion between said two e-beam components so that said two e-beam components have different angles of trajectory;
substantially canceling said dispersion so that said two e-beam components are rejoined in trajectory; and
focusing said two rejoined e-beam components onto an area of the substrate.

16. The method of claim 15,
wherein impingement of one component of the two e-beam components onto the area generates a scattered e-beam, and
wherein impingement of both components of said e-beam onto the area provides compensation for surface charging.

17. The method of claim 16,
wherein said one component comprises the higher-energy e-beam component, and
wherein secondary or backscattered electrons are utilized for imaging.

18. The method of claim 17, wherein the scattered e-beam comprises back-scattered electrons.

19. The method of claim 17, wherein the scattered e-beam comprises secondary electrons.

20. The method of claim 16,

wherein said one component comprises the lower-energy e-beam component, and

wherein the scattered e-beam comprises reflected electrons.

21. The method of claim 16, further comprising:

separating the scattered e-beam from said two e-beam components.

22. The method of claim 16, further comprising:

imaging the scattered electron beam so as to provide image data by which to inspect the substrate.

23. An apparatus for in-line inspection of a substrate, the apparatus comprising:

means for generating dual-energy e-beam including a higher-energy e-beam component and a lower-energy e-beam component;

means for introducing dispersion between said two e-beam components so that said two e-beam components have different angles of trajectory;

means for substantially canceling said dispersion so that said two e-beam components are rejoined in trajectory; and

means for focusing said two rejoined e-beam components onto an area of the substrate.